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February 13, 2004

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FILING DATE: *November 12, 2002*
RELATED PCT APPLICATION NUMBER: *PCT/US03/36320*

By Authority of the
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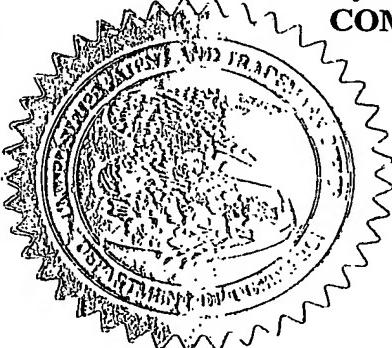
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

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☐ Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (280 characters max)

METHOD AND APPARATUS FOR GENERATING AND PLAYING DIAGNOSTIC MESSAGES INDICATIVE OF MTA PROVISIONING STATUS

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ENCLOSED APPLICATION PARTS (check all that apply)

☒ Specification Number of Pages 3
☐ Drawing(s) Number of Sheets
☐ Application Data Sheet. See 37 CFR 1.76

☐ CD(s), Number
☐ Other (specify)

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)

☐ Applicant claims small entity status. See 37 CFR 1.27.
☐ A check or money order is enclosed to cover the filing fees
☒ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 07-0832
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FILING FEE AMOUNT ($) 160

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____.

Respectfully submitted,
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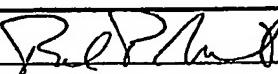
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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

METHOD AND APPARATUS FOR GENERATING AND PLAYING DIAGNOSTIC MESSAGES INDICATIVE OF MTA PROVISIONING STATUS

In accordance with the present invention, if a phone is taken off-hook on an MTA that is not provisioned, improperly provisioned, or placed in an out-of-order state by the MSO, the MTA will generate an appropriate diagnostic audio voice message or tone sequence to the telephone instructing the listener on how to proceed in order to resolve the problem.

Background of the Invention

Media terminal adaptors (MTAs) require a strict provisioning sequence prior to becoming operational. In a PacketCable environment a total of 25 steps must be completed to become operational, and 11 additional steps must be completed in order to establish IPSec security associations with the call agent. These provisioning steps are controlled by the MSO and are a function of the MSO Provisioning Server (MTA DHCP options & MTA configuration file), the MSO's DNS configuration, and the configuration of the MSO call agent and Kerberos Key Distribution Center (KDC.) Failure to properly configure any of these items can leave the MTA in a non-provisioned or improperly configured state which will render the MTA nonfunctional or out-of-order. In this context, out-of-order means that dial tone is not heard on the handset when the phone attached to the MTA is taken off-hook.

Description of the Invention

This invention provides several methods to indicate to the user that the MTA has not been properly configured and that the user should contact their service provider to resolve the issue. These methods involve playing an audio sequence consisting of a voice message and/or a sequence of audio tones to indicate the specific problem and what to do to resolve the issue.

Existing cable modems and MTAs, use discrete LEDs or a 7-segment LED display to indicate provisioning status and possibly, the first provisioning step that has failed. Due to the small number of product LEDs (typically 5 to 6, or one 7-segment display) and large number of provisioning steps it is difficult to indicate the precise cause of a provisioning failure. Approaches have been used to display the provisioning status via blinking LEDs, displaying the status code in a binary format, etc. Many non-technical consumers are not able to easily correlate the blinking LED codes with a table in the user manual in order to resolve their specific problem.

In this invention, the MTA generates an audible diagnostic message to the user, over the attached telephone(s), indicating:

1. the presence of a provisioning error
2. the nature of the error (which provisioning step failed)
3. what step should be taken to resolve the error.

In this invention, the audible message can consist of either a voice message or a sequence of audio tones, or both. The voice message and/or audio tone sequence can be either

1

canned (fixed, stored in local non-volatile memory) or dynamically generated. The audio clip could combine fixed voice text with dynamically-generated voice text such as a specific telephone number to dial. The variable information used to generate the dynamic portion of the message could be stored in non-volatile memory or passed to the MTA via a proprietary configuration file TLV or MIB element. In this way the diagnostic message can be tailored for a specific service provider, location, etc.

In addition to or alternatively, a sequence of audio tones (including a 'beep' sequence or a series of DTMF tones) could be played to convey the diagnostic message. DTMF tones would be suitable for machine recognition, by, for example, test equipment used by a field technician.

In addition to or alternatively, the telephone handset keypad can be used to request additional diagnostic or status information. An audible message can prompt the listener to enter one or more keypad digits in order to retrieve more detailed status information. The information would not be limited to diagnostics, and could include MTA operating status such as current upstream and downstream frequency, power level, and signal to noise ratio.

In this invention, the MTA's DSP (digital signal processor) and POTS (plain old telephone service) endpoint circuitry is enabled early in the boot-up sequence, prior to the start of device provisioning. If MTA provisioning is successful, the MTA enters its normal operating mode and the user hears dial tone when he takes a phone off-hook. If MTA provisioning was not successful or if the service provider placed the MTA in an out-of-order state via MTA configuration file or MTA MIB element settings, the MTA will play an appropriate diagnostic audio message (voice and/or tone sequence) when the user takes the phone off-hook. The MTA software will generate audio messages by encapsulating the audio in an RTP (real time protocol, RFC-1889/1890) packet stream to emulate the reception of said data from the network. This audio stream, consisting of an ordered sequence of near-synchronous RTP packets, is sent to the MTA DSP and endpoint circuitry. As with audio packets received from the network, the DSP de-packetizes the RTP audio data and places it in its outbound jitter buffer for use by the speech decoder circuit. The speech decoder converts the digital PCM audio data to analog samples which are reconstructed in the endpoint circuitry and played to the listener. The existing endpoint circuitry and control software monitors the telephone hook state and generates the diagnostic audio message when an off-hook condition is detected.

As an example, the following audio messages could be played under the following provisioning error conditions:

Unable to obtain IP address	"Your MTA cannot obtain a network address. Please contact XYZ Cable Company at 317-587-3168." Thank you."
Missing DHCP options	"Your MTA requires one or more missing DHCP options. Please contact XYZ Cable Company at 317-587-3168." Thank you."

2

Exp. mail: EV 104020493 US

MTA is provisioned but not enabled

"Your MTA has been administratively disabled. Please contact XYZ Cable Company at 317-587-3168." Thank you."